Claims

1. Pleatable filter structure for use in a filter panel, containing ion exchange particles distributed within a fibrous framework,
characterised in that the filter structure is expanded so as to contain enough space to allow the ion exchange particles to swell or to be in a swelled state as compared to dry ion exchange particles, without additional expansion of the filter structure.

2. The filter structure of claim 1, wherein the fibrous framework comprises composite structural fibers (1) and composite thermoplastic fibers (4), the composite structural fibers (1) comprising a first relatively higher melting component and a first relatively lower melting component, the first relatively higher melting component having a melting point at least 20 °C higher than the first relatively lower melting component, and the composite thermoplastic fibers (4) having a relatively smaller denier than the structural fibers (1) and comprising a second relatively higher melting component and a second relatively lower melting component,
wherein the composite structural fibers (1) form a thermally bonded, fibrous network in which the first relatively lower melting component bonds the structural fibers together at the cross-over points (2) to stabilize the fibrous network, and the composite thermoplastic fibers (4) are dispersed throughout and are bonded to the fibrous network by the application of heat so as to be immobilized, and wherein the ion exchange particles are bonded by the application of heat to the smaller denier composite thermoplastic fibers (4) and the filter structure is expanded so as to contain enough space to allow the ion exchange particles (3) to swell or to be in a swelled state as compared to dry ion exchange particles, without additional expansion of the filter structure.

3. The filter structure of claim 1 or 2, wherein the expanded filter structure contains enough space to allow an increase of the ion exchange particle diameter of at least 38 % as compared to dry particles.

4. The filter structure of any one of claims 1-3, wherein the expanded filter structure contains enough space to allow an increase of the ion exchange particle diameter of at least 47 % as compared to dry particles.

5. The filter structure of any one of claims 1-4, wherein the expansion of the filter structure has been achieved by a process in which the filter structure was exposed to a humid environment or water.

6. The filter structure of any one of claims 1-5, wherein the ion exchange particles are macroporous polymers.

7. The filter structure of any one of claims 1-6, wherein the load of ion exchange particles is 100-2000 g/m^2, preferably 300-1000 g/m^2 and most preferably 400-700 g/m^2.

8. The filter structure of any one of claims 1- 7, wherein the ion exchange particles are monospherical and has a diameter of 425-525 μm.

9. The filter structure of any one of claims 1- 8, wherein the fibrous framework comprises thermally bonded fibers.

10. The filter structure of any one of claims 1-9, wherein the fibrous framework comprises thermally bonded, fibrous network of coarse structural thermoplastic fibers and having fine thermoplastic fibers of relatively smaller denier than the structural fibers being dispersed throughout and bonded to the fibrous framework by the application of heat so as to be immobilized, wherein the ion exchange particles are bonded by the application of heat to the smaller denier composite thermoplastic fibers.

11. A filter panel comprising the filter structure of any one of claims 1-10, wherein the filter structure is pleated and fixed into a filter panel frame.

12. The filter panel of claim 11, wherein the pleated filter structure has 0-25 pleats/dm, preferably 5-20 pleats/dm and most preferably 8-15 pleats/dm.

13. The filter panel of claim 11 or 12, wherein the height of the pleats is 10-300 mm, preferably 15-150 mm and most preferably 15-100 mm.

14. The filter panel of any one of claims 11-13, wherein the frame is made of stainless steel or aluminium.

15. The filter panel of any one of claims 11-14, wherein the pleated filter structure is fixed to the frame by means of a polyurethane adhesive, having a total outgassing lower than 10 µg/g, confirmed by thermal desorption gas chromatography mass spectroscopy (TD-GC-MS), with TD performed at 50 °C for 30 min and n-decane as external standard.

16. The filter panel of any one of claims 11-15, wherein exterior sealing strips for avoiding air bypass are made from a polymer having a total outgassing lower than 10 µg/g, confirmed by thermal desorption gas chromatography mass spectroscopy (TD-GC-MS) with TD performed at 50 °C for 30 min and n-decane as external standard.

17. Method of manufacturing the filter structure according to any one of claims 1-10, wherein a pleatable filter structure including ion exchange particles distributed in a fibrous framework, **characterized in** that the pleatable filter structure is subjected to a moisture treatment in which it is exposed to a humid or water containing environment, whereby the ion exchange particles swell and cause a permanent expansion of the filter structure.

18. The method of claim 17, wherein the fibers of the fibrous framework are stretched as a result of the swelling of the ion exchange particles, and remain stretched.

19. The method of any one of claims 17-18, wherein the filter structure is exposed to this environment until the ion exchange particles have reached a moisture content of at least 20% by weight.

20. The method of any one of claims 17-19, wherein the filter structure is exposed to this environment until the ion exchange particles have reached a moisture content of at least 30 % by weight.

21. The method of any one of claims 17-20, wherein the ion exchange particles have a moisture content of less than 10 % prior to the moisture treatment and present an increase in diameter during the moisture treatment of up to 38 %.

22. The method of any one of claims 17-21, wherein the humid environment used in the moisture treatment has a relative humidity of at least 70 % at a temperature of 20 °C.

23. The method of any one of claims 17-22, wherein the humid environment used in the moisture treatment has a relative humidity of at least 80 %, preferably at least 90 % at a temperature of 30 °C.

24. The method of any one of claims 17-23, wherein the filter structure is subjected to the moisture treatment in a batch process.

25. The method of any one of claims 17-23, wherein the filter structure is subjected to the moisture treatment in a continuous process.